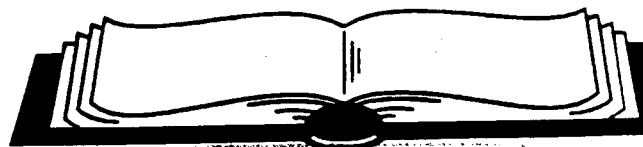


NEW JERSEY

1999-2000
Guidelines and
Application

BEST

ORIGINAL

PRACTICES

Deadline for Application to County Office:
NOVEMBER 22, 1999

Category	Mathematics	(Application is limited to one category. See page 3 for details.)
Practice Name	"100" Track Dragster	
Number of Schools with Practice	1	(If more than one school or district, read and complete information on page 2.)

County	Bergen		
District (Proper Name)	Paramus Public Schools	School District	
District Address	street/p. o. box 145 Spring Valley Road		
	city Paramus	07652	zip code
District Telephone	201-261-7800	Fax 201-261-5861	Email
Chief School Administrator	Dr. Janice Dime		
Nominated School #1 (Proper Name)	West Brook Middle School		
School Address	street/p. o. box 560 Roosevelt Blvd.		
	city Paramus	zip code 07652	
School Telephone	201-652-3907	Fax	Email
School Principal	William Freeman		
Program Developer(s)	Herb Dreyer, Ken Van Valen, Ellen Van Howling		
Chief School Administrator's or Charter School Lead Person's Signature			

FOR USE BY COUNTY SUPERINTENDENT OF SCHOOLS ONLY

Approved: ☒ Yes ☐ No County Superintendent's Signature

NEW JERSEY STATE DEPARTMENT OF EDUCATION

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NEW JERSEY BEST PRACTICES 1999-2000 APPLICATION

Application Requirements:

- ◆ **RESPONSES** to the information and the statements below must be **ANONYMOUS**. No reference should be made to the names of the district or the school(s). Use the words "the school" or "the schools" in referring to the applicant in responding to the statements.
- ◆ **USE ONLY THE SPACE PROVIDED ON THE APPLICATION FORM** on pages 1, 2 (if applicable) and 4 and **THE NUMBER OF LINES SPECIFIED FOR RESPONSES** to the statements. Do not include any additional materials, as they will not be reviewed in the selection process.
- ◆ Application must be keyboarded on 8 1/2" x 11" white paper, portrait format. Ten-point or larger computer font or twelve-pitch or larger typewriter font must be used. (This sentence is in ten-point.)
- ◆ **KEYBOARDED RESPONSES** to the statements below must be no more than a total of three pages. Keyboard the statement followed by the response. Format your response to the number of lines specified.
- ◆ The information on page 4 and the keyboarded responses to statements must be printed or copied on one side of the page. The information on pages 1 and 2 (if applicable) must be printed or copied on one side of the page. Staple pages 1 and 2 (if applicable) and 4 and the keyboarded responses together.
- ◆ The original application must be signed by the district chief school administrator or charter school lead person, indicating his/her approval.
- ◆ The original and seven copies of the application must be submitted to the county superintendent of schools by November 22, 1999, with the Itemized List of District Applications form. Keep the seven copies of each application together with the original containing the signature of the district chief school administrator or charter school lead person on the top of each set.
- ◆ **FAILURE TO COMPLY WITH THE PROCEDURES FOR SUBMISSION OF THE APPLICATION MAY RESULT IN THE ELIMINATION OF THE APPLICATION.**

The following data is required to assist the panelists in the evaluation of the application:		
Type of School	Grade Levels	Practice Name "100" Track Dragster
Elementary School		
<input checked="" type="checkbox"/> Middle School	5-8	
Junior High School		Number of Schools with Practice 1
High School		Number of Districts with Practice 1
Other: _____		

Check the ONE CATEGORY into which the practice best fits.		
<input type="checkbox"/> Arts (Visual and Performing Arts) <input type="checkbox"/> Assessment/Evaluation <input type="checkbox"/> Bilingual Education and Diversity <input type="checkbox"/> Citizenship/Character Education <input type="checkbox"/> Early Childhood Education Programs <input type="checkbox"/> Educational Support/Guidance and Counseling Programs (services contributing to high student achievement)	<input type="checkbox"/> Educational Technology <input type="checkbox"/> Health and Physical Education <input type="checkbox"/> Language Arts Literacy <input checked="" type="checkbox"/> Mathematics <input type="checkbox"/> Professional Development <input type="checkbox"/> Public Engagement <input type="checkbox"/> (family involvement and partnerships with business, community and/or higher education)	<input type="checkbox"/> Safe Learning Environment <input type="checkbox"/> School-to-Careers/Workplace Readiness <input type="checkbox"/> Science <input type="checkbox"/> Social Studies <input type="checkbox"/> Special Education <input type="checkbox"/> World Languages

1. Describe the practice proposed for recognition, and list its objectives. Detail how the practice is innovative, how it promotes high student achievement and how it can be replicated. (Maximum of 50 lines for response)
2. Describe the educational needs of students that the practice addresses and how they were identified. List the *Core Curriculum including the Cross-Content Workplace Readiness Standards** addressed by the practice and describe how the practice addresses the standard(s). (Maximum of 50 lines for response)
3. Document the assessment measures used to determine the extent to which the objectives of the practice have been met. (Maximum of 60 lines for response)

*The 1996 edition of the *Core Curriculum Content Standards* published by the New Jersey State Department of Education was disseminated to all districts and charter schools and is available on line through the department's website at <http://www.state.nj.us/education>.
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1. **Describe the practice proposed for recognition, and list its objectives. Detail how the practice is innovative, how it promotes high student achievement and how it can be replicated.**

"When am I ever going to use this math?" Our middle school Technology Education program has found an answer to this question.

The eighth grade Technology class utilizes classroom math and science concepts as the students develop a dragster to race on our middle school "100" track. Students are faced with a problem to design, build and race a dragster, a middle school student's dream. Both males and females enjoy the challenge of building a dragster that is like a miniature rocket powered vehicle. The process they follow is similar to the one used by automobile designers and engineers throughout the world. They need to come up with a fantastic and creative design for building a dragster. All student-designed cars will be compared for excellence in design, creativity, craftsmanship and speed.

Thumbnail sketches, rough sketches, detailed drawings all precede the transfer of their ideas to a chosen solution and then to the development of a prototype. The forces of friction, drag, and aerodynamics are evaluated in a wind tunnel. The evaluation may lead to a successful design, or it may lead to the need for redesign. At this point every dragster prototype is different, based on every student's individual creativity, research, and design. The big day arrives when the transfer is made from the prototype to the final dragster. Enthusiasm is very high; they will now finalize their design, fabricate a sleek wooden vehicle, and prepare for the preliminary run on the "100" track. Their dragsters need to be reevaluated due to the change of materials, and students will decide and implement changes needed for the final design. After painting and detailing their dragsters, the big day arrives and the race begins; spectators mingle with participants to cheer on their favorites. A computer activated program fires the cars. As they race down the track at speeds of approximately twenty-five miles per hour, the computer records the times of each participant in a two-vehicle competition. The entire process is evaluated: redesign takes place and vehicles are placed on display for the entire school population to view.

The question "When am I ever going to use this math?" has been answered. The math concepts taught in the academic classroom have been applied during this experience. Concepts of measuring, transferring (construct and use pictorial, symbolic, and graphical models), drawing to scale, estimating miles per hour, and developing the mean and median are included. Students also come to recognize there are multiple ways to solve a problem, weigh their relative merits, and select and use appropriate problem-solving strategies.

Objectives

To apply mechanical, electrical and/or computer controls to the design and construction of a vehicle to solve a technological problem.

To use the nine step technological design and problem solving model in the documentation of a solution.

To use materials, tools and equipment in an appropriate and safe manner.

To apply concepts of physical science to technological solutions.

To use the systems approach to explain technological devices.

To apply the concepts of mathematics, science, language arts and the arts in the context of contemporary technology.

To develop an attitude that encourages individuals to keep pace with a rapidly changing society and realize that education is a life-long process.

Replication

The "100" activity can be replicated in any school with materials, supplies and equipment necessary to design, fabricate and test a vehicle. The minimum time allowance for successful completion of this activity is twenty, forty-two minute periods or their equivalent. This program has been developed for eighth graders; it can be adapted for implementation at different grade levels.

Innovation

The activity is innovative because it combines mathematics, science and the arts in a problem-solving format that students enjoy. Students enthusiastically use their math skills to design, test, and construct their vehicles. In this day and age when students can be turned off to school, student involvement and interest in this activity is very high.

2. **Describe the educational needs of students that the practice addresses and how they were identified. List the Core Curriculum Content and/or Workplace Readiness Standards addressed by the practice and describe how the practice addresses the standard(s).**

Educational needs

The educational needs of students were identified in previous classes where many students did not have a high regard for using mathematic skills outside the academic classroom. The design of the dragster allows students to use mathematics in a career related setting. There was also found to be a need for students to incorporate other academic skills into one activity. The problem solving activity allows for the interdisciplinary interaction of many subject areas, which addresses the needs students will face in all aspects of life.

Core Curriculum Content Standards Addressed by the Practice

(Below are listed the Core Curriculum Content Standards with Cumulative Progress Indicators where appropriate).

Cross-Content Readiness Standards

2. All students will use technology, information and other tools.
3. All students will use critical thinking, decision-making, and problem-solving skills.
4. All students will demonstrate self-management skills.
5. All students will apply safety principles.

Mathematics

- 4.1 All students will develop the ability to pose and solve mathematical problems in mathematics, other disciplines and everyday experiences.
 12. Construct and use concrete, pictorial, symbolic and graphical models to represent mathematics and other areas.
 13. Recognize that there may be multiple ways to solve a problem, weigh their relative merits and select and use appropriate problem solving strategies.
- 4.3 All students will connect mathematics to other learning by understanding the interrelationships of mathematical ideas and the roles that mathematics and mathematical modeling play in other disciplines and in life.
 10. Apply mathematics in their daily lives and in career-based contexts.
- 4.9 All students will develop an understanding of and will use measurement to describe and analyze phenomena.
 13. Convert measurement units from one form to another and carry out calculations that involve various units of measurement.

Science

- 5.1 All students will learn to identify systems of interacting components and understand how their interactions combine to produce the overall behavior of the system.
 4. Describe components of a system and how they influence one another
 6. Disassemble and reassemble the components of a system, analyzing how

they interact with each other.

5.4 All students will develop an understanding of technology as an application of scientific principles.

8. Explain how engineers and others apply scientific knowledge to solve practical problems.

5.9 All students will gain an understanding of natural laws as they apply to motion, forces and energy transformations.

10. Investigate how the force of friction acts to retard motion.

Language Arts

3.1 All students will speak for a variety of real purposes and audiences.

14. Use clear, concise, organized language in speaking situations.

Visual Arts

1.3 All students will utilize arts elements and arts media to produce artistic products and performances.

2. Demonstrate appropriate use of technology, tools, terminology, techniques and media in the creation of dance, music, theater or visual arts.

1.4 All students will demonstrate knowledge of the process of critique.

3. Document the assessment measures used to determine the extent to which the objectives of the practice have been met.

Throughout this assignment each student is required to record their progress using a nine-step process. This includes the following documentation:

1. Analysis of the problem
2. Design Brief – a statement of the assignment including the specifications for solving the problem.
3. Research
4. Sketches of alternate solutions
5. Choice of a solution with rationale for choice given.
6. Preparation of materials
7. Construction of prototype
8. Evaluation
9. Redesign

As students record their progress, they are consistently assessing their experiences in order to proceed through the different levels of the project. Students are involved in individual assessment and peer assessment. Their first experience with assessment is to evaluate their research in order to propose three possible solutions to the problem. To do this they sketch three different models of a dragster that they believe will be aerodynamically successful. Students then assess their possible solutions, choose what they believe to be the best design for a dragster and state their rationale for their choice. Once decided they begin to construct a polystyrene prototype, transferring measurements, shapes, and specifications. As students begin the construction of the prototype, teachers check the specifications and ask guiding questions to correct any inadequacy in design and/or measurements. Students use principles of math to design their prototype and make necessary changes.

Students are then ready for testing of their prototypes using the wind tunnel. The wind tunnel enables them to check the aerodynamic design of the vehicle in several ways including airflow, velocity, and/or drag. They then reassess their design and usually decide to make changes to improve the aerodynamics of their vehicle. The students then construct their model using basswood, incorporating their changes based on the results of their experimentation. They are now ready to test their vehicle on its preliminary run on the "100" track. Throughout this process teachers lead discussions with students at their "design" meetings for the purpose of assessing student thought processes and guiding their progress. Students will also learn from other students as they compare their design in relation to other students' designs and the reasoning behind their choices.

Once students race their vehicles on the trial run, they are ready to make their final self evaluation and alter their vehicles again using the principles gathered throughout the process. Vehicles are now painted and prepared for the final run. The race begins! Computerized starting and timing will determine the best overall designed dragster. The teacher again leads a discussion analyzing the results, and students identify the factors that made the winner a success. The students complete the final evaluation as they critique their dragster, making their recommendations for redesign based on what they learned from the final race.